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NOAA Technical Report NMFS SSRF-750

World Literature to Fish Hybrids With an Analysis by Family, Species, and Hybrid: Supplement 1

Frank J. Schwartz

November 1981



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service

NOAA TECHNICAL REPORTS

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728. Vertical sections of semimonthly mean temperature on the San Francisco-Honolulu route: From expendable bathythermograph observations, June 1966-December 1974. By J. F. T. Saur, L. E. Eber, D. R. McLain, and C. E. Dorman. January 1979, iii + 35 p., 4 figs., 1 table.

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732. Assessment of the Northwest Atlantic mackerel, *Scomber scombrus*, stock. By Emory D. Anderson. April 1979, iv + 13 p., 9 figs., 15 tables.

733. Possible management procedures for increasing production of sockeye salmon smolts in the Naknek River system, Bristol Bay, Alaska. By Robert J. Ellis and William J. McNeil. April 1979, iii + 9 p., 4 figs., 11 tables.

734. Escape of king crab, *Paralithodes camtschatica*, from derelict pots. By William L. High and Donald D. Worlund. May 1979, iii + 11 p., 5 figs., 6 tables.

735. History of the fishery and summary statistics of the sockeye salmon, *Oncorhynchus nerka*, runs to the Chignik Lakes, Alaska, 1888-1956. By Michael L. Dahlberg. August 1979, iv + 16 p., 15 figs., 11 tables.

736. A historical and descriptive account of Pacific coast anadromous salmonid rearing facilities and a summary of their releases by region, 1960-76. By Roy J. Wahle and Robert Z. Smith. September 1979, iv + 40 p., 15 figs., 25 tables.

737. Movements of pelagic dolphins (*Stenella* spp.) in the eastern tropical Pacific as indicated by results of tagging, with summary of tagging operations, 1969-76. By W. F. Perrin, W. E. Evans, and D. B. Holts. September 1979, iii + 14 p., 9 figs., 8 tables.

738. Environmental baselines in Long Island Sound, 1972-73. By R. N. Reid, A. B. Frame, and A. F. Draxler. December 1979, iv + 31 p., 40 figs., 6 tables.

739. Bottom-water temperature trends in the Middle Atlantic Bight during spring and autumn, 1964-76. By Clarence W. Davis. December 1972, iii + 13 p., 10 figs., 9 tables.

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742. Water structure at Ocean Weather Station V, northwestern Pacific Ocean, 1966-71. By D. M. Husby and G. R. Seckel. October 1980, 18 figs., 4 tables.

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U.S. DEPARTMENT OF COMMERCE

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National Oceanic and Atmospheric Administration

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National Marine Fisheries Service

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World Literature to Fish Hybrids With an Analysis by Family, Species, and Hybrid: Supplement 1

FRANK J. SCHWARTZ¹

ABSTRACT

Supplement 1 comprises 1,814 citations published between 1971 and October 1980 which deal with fish hybrids of the world. Continuing the format of the original compilation, each reference has been read, analyzed, and referenced by author, family, species, and hybrid cross.

INTRODUCTION

This supplement compilation is a continuation of the hybrid bibliography published by Schwartz in 1972 as: Publication 3 of the Gulf Coast Research Laboratory Museum, Ocean Springs, Miss., 328 p. The 1972 publication comprised 1,945 citations published prior to 1971. An additional 594 papers, published between 1820 and 1970 are included in the present publication. This supplement publication contains a total of 1,814 papers published between 1971 and October 1980. As in the original, each reference has been read, analyzed, and referenced by author, family, species, and hybrid cross.

Examination of this bibliography reveals that a handful of scientists from Europe, Asia, Japan, and the United States still dominate the world literature on fish hybrids. English, Russian, and German are the main languages in which hybrid papers are published. Contrary to the 1972 compilation, present day hybrid study emphasis has changed drastically from pure hybrid descriptions to DNA, allele, and isozyme crosses, to more work in producing hybrids to meet man's food needs (i.e., sturgeons in Russia, striped bass-white bass crosses in the United States, carp-goldfish-grass carp crosses in Israel and Asia). Misra's seven papers (1971-75) are the most extensive in attempting mathematical definition and testing of a hybrid's status and designation.

This supplement treats a total of 50 families of fishes with known hybrid crosses. The bulk of the hybrids are members of the families Centrarchidae, Cyprinidae, Poeciliidae, and Salmonidae. This contrasts with the original compilation.

PROBLEMS WITH LITERATURE

An inherent problem in dealing with the world hybrid fish literature continued to be the definition of what was a hybrid. To sort out all the definitions and make arbitrary decisions as to an author's real meaning or interpretation would have taken far longer than the 8 yr spent in preparing this publication. I leave final decisions of definitions and interpretation to the reader.

Similarly, decisions relating to systematic status of many of the species or crosses listed are left to the reader. Currently,

families are being lumped or split, species are constantly being updated by recent work, and even old established species names have been changed. I am fully aware of these changes but rather than have to make again many arbitrary decisions of what should be a particular species's or hybrid's true identity or to what species the author was really referring, I left them cited as originally found or spelled. Only the families have been updated (where lumped) to relieve the confusion of referring to family names not now recognized. Thus, the family Salmonidae is not treated by its subfamilies Coregoninae, Salmoninae, or Thymallinae. The remaining families which have had minor status changes have been updated (Scombridae to include Cybiidae) so that no subfamilies are treated.

Further problems existed in whether a reference was dealing with a natural or experimental hybrid. Few authors, other than those where experimental results were evident or so stated, specifically earmarked what they were studying.

While all would wish to find only one spelling of a species name, all variations were included. The same is true of author names which, in Russian, were often spelled many ways (i.e., Nikioljuki, Nikoljukin, Nikolukin, Nikoljukin).

One other problem that persisted, from the original publication, was that many authors, especially European, cited a hybrid cross by listing the male species first, followed by the female partner. Others, the majority, listed the female member of the hybrid first, with the male species second. I kept the entries as they were originally cited and, where known, have included the female (usually first) or male cross designations (i.e., *Cyprinus carpio* ♂ × *Carassius auratus* ♀).

Further problems arose in how to cite female workers. Most compilations spell out a woman's first name with only initials designating male authors. Herein, all names of women are listed by initial only, except those of Russian or Slavic origin where the "a" ending signifies a woman. Because this bibliography was computer created I have not included any diacritic marks for Germanic, Slavic, or other languages. Author's names, such as McAfee, have the "c" on the same line rather than one-half space upward. Another frustrating aspect of the bibliography was in dealing with Russian references published by *Rybnoe Khozastvoe* as there are two journals with the same name, one published in Kiev, the other in Moscow. Most literature citations failed to note city of publication. This along with use of the issue numbers as volume numbers created havoc and delays in a citation's retrieval. I have noted the city of publication in every case, where feasible.

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Each of the 1,814 references in this bibliography has been numbered. All references are listed alphabetically. The author, fish family, species, and hybrid indexes are listed alphabetically, regardless of systematic position or status of the family, species, or hybrid. Each reference was read in its entirety and all species or crosses therein are noted (rather than that which may be stated only in the title). Common names are interspersed alphabetically within the appropriate species or hybrid listings. Where recent papers were located or appeared in the literature, as the final typing was in preparation, 22 cases, the reference was given the next sequential number followed by an "a," etc. and inserted in the proper alphabetical position in the citation sections (i.e., 1221a follows 1221). Since this bibliography was so large and computer developed, merging the entries from four separate computer sources often prevented the desired sequential numerical order to the citations which, however, are listed alphabetically throughout. Thus, 23 numbers, 27, 47, 49, 55, 67, 69, 77, 305, 340, 368, 403, 877a, 891, 1,000, 1,183, 1,186, 1,421, 1,450, 1,571, 1,586, 1,665, 1,715, and 1,766 are missing as a result of deletion of duplicated citations which had entered the various files.

To use the bibliography when the author of a hybrid is known, proceed directly to the citation or author section to learn what papers have been included under his or her name. If one knows the author only, proceed to the author section and find (i.e., F. Anders published 45 papers) each of the numbered papers that he authored or coauthored. Knowing the fish family but not the author, etc., a check of that section will steer you to all papers dealing with hybrids known for that family (i.e., Cyprinidae, etc.). Likewise, if one knows F. Anders published a paper on swordtail-platyfish hybrids, go to the species or cross or author list to locate the species, remembering that if a taxonomic change has taken place the original generic notation will be found (i.e., presently *Poecilia* for *Molliensia* of earlier references). I must reemphasize that one should check all possible spelling combinations for an author or species name before being satisfied all references have been located.

If a hybrid cross acted as a species in a cross then that hybrid cross was included in the species list. This prevailed with F_1 and F_2 back crosses (i.e., $(\text{Salmo alpinus} \times \text{S. fontinalis}) \times \text{S. fontinalis}$) where each species was listed in addition to $(\text{S. alpinus} \times \text{S. fontinalis})$ which was acting as a species in the species listing. Likewise, each hybrid cross has not been reversed in the hybrid cross section, unless attempted by the author (i.e., $\text{S. alpinus} \times \text{S. fontinalis}$ would not be listed for a pertinent reference unless the author attempted $\text{S. fontinalis} \times \text{S. alpinus}$ and $\text{S. alpinus} \times \text{S. fontinalis}$ crosses).

Readers wishing information regarding the listed references can correspond with me as about 95% are within my holdings as originals, Xerox, or photocopies.

ACKNOWLEDGMENTS

I would like to single out several people who were most instrumental in aiding with this bibliography. To David Harris of Atlantic Analysis Corporation, Norfolk, Va., fell the enormous task to develop a computer program that would treat the hundreds of entries that are included herein. This was achieved by use of two Hewlett Packard 9830's sorting four computer disks simultaneously and 15 programs. His diligence in resolving the

myriads of program problems and aspects relating to information retrieval were tremendous. Helen Nearing was responsible for all program operations. She, along with Carolyn Morgan, deciphered all my raw hand scribbles onto standard input sheets prior to computer analysis. Helen Nearing, Janice Manyak, and Jacqueline Tate were instrumental in checking and verifying all information once out of the computer prior to final preparation and entry into an IBM System 6 Information Processor. Brenda Bright of the Institute of Marine Sciences spent many hours locating and requesting many of the references herein. The staff of Wilson Library main campus, University of North Carolina, were especially helpful with Russian citations and their location. Use of many other Institute of Marine Sciences, Morehead City, N.C., facilities is also acknowledged.

Others who were exceptional in their help to locate or supply me with references were: J. Atz, American Museum of Natural History; C. Atkinson, Seattle, Wash.; E. Crossman, Toronto, Canada; F. Anders and J. and Ursula Vielkind, Germany; T. Abe and T. Terao, Japan; O. Oliva, Czechoslovakia; Olga Matlak, Poland; P. Banarescu, Romania; G. Svardson, Sweden; and S. Segerstrale, Finland.

I bear full responsibility for errors or omissions that may have crept into this publication. May this compilation be a stimulus and aid to your studies of fish hybrids. Where I have missed citations I hope you will call them to my attention.

Appreciation is also extended to the following who assisted in various ways with the literature research and retrieval. I hope I have neglected no one.

United States

INDIVIDUALS—Alabama: J. Ramsey; California: J. Fitch, C. L. Hubbs (deceased), Patricia Powell; Colorado: R. Behnke; Washington, D.C.: C. Messick, M. Rose; Florida: F. Ware; Idaho: R. White; Illinois: B. Burr, M. Cimino, R. Mayden, L. Page, P. Smith; Iowa: B. Menzel; Maryland: Carolyn Essex, T. Koo, Chu-fa Tsai; Massachusetts: Jane Fessenden, S. Shapiro, R. Flescher; Michigan: R. Bailey; Missouri: A. Ming, W. Pflieger; New Jersey: W. Burgess, Martha Ireland; New York: J. Atz, K. Kallman, C. L. Smith, D. Webster; North Carolina: Sue Applebaum, Brenda Bright, A. F. Chestnut, R. Goldstein, Ann Hall; Ohio: B. Grimstead; Oregon: C. Bond, Shirley Arndt, C. Schreck; Pennsylvania: J. Wright; Texas: J. Gold, M. Siciliano; Virginia: A. H. Underhill; Washington: C. Atkinson, A. Novotny, L. Smith; Wisconsin: Lynn Bellehumer, V. Cvancara, Betty Les; Wyoming: R. Simon.

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O. Oliva; England: Ethylwynn Trewavas; Finland: S. Segerstrale; Germany: F. Anders, Hertha Larga, N. Maron, M. Schwab, J. Vielkind, Ursula Vielkind; Israel: G. Hulata, R. Moav; Japan: T. Abe, S. Asano, T. Narita, Y. Ojima, A. Taniguchi, T. Terao; Poland: Matylda Gasowska; Republic of China: Yenpin Li; Romania: P. Banarescu; Sweden: L. Nyman, G. Svardson; U.S.S.R.: A. Kersakina.

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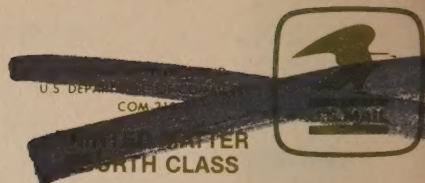
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